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ABSTRACT

Because a science class may contain students with greatly differing reading abilities, the science teacher must not only teach science concepts, but also design an instructional program which meets the needs of students at all reading levels. Such a program might be developed from the following ten ideas. Idea one, guided reading instruction, is a general strategy for aiding students in reading science. Idea two, guided reading sheets, is a means for differentiating reading assignments. Idea three suggests ways of using a single textbook creatively. Idea four is the use of multi-level materials, while idea five adds a multiple materials approach. Idea six is the use of discussion groups composed of students with various achievement levels. The creation of word banks, idea seven, can be useful in encouraging students to learn technical terms. Writing activities, idea eight, can be used to help students work through science processes which they find difficult. Idea nine is the use of science-related literature to interest students, and idea ten is the use of science materials to encourage creative thinking. These ideas may be used singly or in combination; they may also be adapted to fit the needs of a specific science program. (FL)

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WHAT THE READING TEACHER SAYS TO THE SCIENCE TEACHER: TEN IDEAS FOR ADAPTING SCIENCE-RELATED READING MATERIALS TO STUDENTS' READING NEEDS

Joanne P. Olson

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Introduction

Almost any science class contains students who read several years above grade level as well as others who read several years below grade level. In an upper elementary school class the range between the reading abilities of the weakest and the strongest readers can be as great as seven years, and in a high school science class it can be as much as twelve years. Therefore, the science teacher is faced not only with the task of teaching science concepts but also with the problem of designing science instruction which takes into account the students' differing reading abilities.

Presented here are several ideas for adapting science-related reading materials to the reading needs of science students at varied reading levels. Idea one presents a general strategy for aiding students in reading science materials and idea two provides a means for differentiating reading assignments for students reading on different levels. Ideas three, four, and five present ways to select and adapt the reading materials that students will be using. The remaining ideas move away from a textbook orientation and suggest strategies and tradebooks that might be used as a part of science instruction.

Idea One: Guided Reading Instruction

The science teacher might use the following five steps in conjunction with having the students silently read a selection in a science textbook.

Step One: In order to reduce the students' reading problems, introduce them to the concepts and technical vocabulary necessary to understanding the passage before they begin reading it.

Step Two: Before the students begin reading the selection give them a purpose for doing so. That is, instead of simply saying, "Read Chapter Three," say, "Read Chapter Three to identify at least two respresentatives of any five species classified in a given sub-phylum."

Step Three: After the students have read the passage, discuss it with them.

Step Four: Identify and provide instruction in any needed reading skills. For example, if the students do not know how to classify, the teacher must show them how to set up appropriate classification systems.

Step Five: Have the students perform extension activities such as related supplementary reading or creative activities such as collecting advertisements about ecology and the environment.(3, 6)

Idea Two: Guided Reading Sheets

Guided reading sheets are used to set specific purposes for silent reading (Idea One, Step Two) and they should be designed with the student's reading level in mind. Thus, the science teacher might make up approximately three guided reading sheets for any given reading selection. Each sheet would include questions on a level of difficulty appropriate to the reading ability of the student for which it is intended. For example, weak readers might be assigned guided reading sheets with questions requiring only simple factual responses. The sheets assigned to average readers might include questions which call for inferential reasoning. Those given to the best readers might contain questions which require not only comprehension of the material but also application of the material to new situations. However, the questions on each guided reading sheet would be related to the main thrust of the lesson so that the students could work together in discussions and extension activities (Idea One, Steps Three and Five).(5)

Idea Three: Use a Single Textbook Creatively

When a single textbook supplied by the school is a basic resource its use may be varied according to the reading abilities of the students. Even if Guided Reading Instruction (Idea One) and Guided Reading Sheets (Idea Two) are used, some of the weakest readers in the science class may not be able to understand the textbook material. In this case, the teacher might read the lesson aloud to the students instead of having them struggle with the material alone. Alternately, the teacher might provide the students with a summary of the material either verbally or on tape. Thus, the students would have some basis for answering the questions on the guided reading sheet and entering into discussions and follow-up activities (Idea One, Steps Four and Five).(3)

Idea Four: Use Multi-Level Materials

Occasionally it is possible to find written materials which cover the same concepts as those in the basic science textbook but which are written at an easier reading level. For example, the same principles of electricity explained in a textbook written on the grade ten level might be equally well explained in a textbook written on the grade five level. Although such materials are not always easy to find, for some topics they are plentiful. Therefore, searching for multi-level materials might prove worthwhile.(3)

Idea Five: Use Multi-Level, Multiple Materials

Although all students are approaching similar topics, variety can be introduced into a science program through the use of multi-level materials which cover several aspects of a specific topic. Fox example, while some students are studying ecology from a textbook, others might use tradebooks or magazines. Titles such as The Mystery of the Everglades and Going to Waster: Where Will All the Garbage Go? are suggested by Troy as readings of interest to

children who are studying ecology. Magazines such as Popular Mechanics, Popular Science, and Psychology Today can also often be used as classroom science resources.(3, 10)

Idea Six: Use Students of Various Achievement Levels in Discussion Groups

Classroom discussions (Idea One, Step Three) can often be profitable when they involve heterogeneous groups of students with varying reading abilities. Since the students are on different reading levels, they may not have all read the same materials and, thus, a diversity of background may have been created which can enhance the group discussion. Additionally, students who are not good readers often possess the skills of listening comprehension needed to profit from group discussions. Furthermore, a student with a low level of reading achievement may have concepts or cognitive skills which allow him to make significant contributions to the discussion.(2)

Idea Seven: Become a Banker

Word banks can be successfully used to encourage students to learn technical terms necessary for understanding science concepts. To set up a word bank, the students should be instructed to write appropriate technical terms on separate cards and to develop a system of word storage and retrieval. Word bank activities might include taking a few moments out from class for students to quiz each other on their knowledge of words from the word banks. The class might be divided into teams so that a correct response by a team member would add points (money) to the score (account) of the respondent's team. The criteria for "knowing" a word might change from day to day. For example, on Monday, students might need only be able to read the word on the card; on

Wednesday, they might have to define it and use it in a sentence; and, on Friday, they might have to classify it with similar words.(8)

Idea Eight: Use Writing to Help Reading

Group writing activities can be used to help students work through science processes which they find difficult and can begin by having the students describe a scientific process in writing. For example, each of a group of students might write on "How to Work With Chemicals" and then work within their groups reading their written descriptions to each other. While doing this, duplications, omissions, and inconsistencies should become obvious so that the students are able to combine their individual written descriptions in the writing of a group paper which describes all necessary steps in the process and which includes a description of the technical terms used so that the paper would be useful to a reader unfamiliar with the process.(7)

Idea Nine: Using Reading Materials to Interest Students in Science

Science educators often ask, "How can I get my students interested in science?" One way may be to use science-related literature such as Jaws which was shown to be liked by many of the students responding to a University of Iowa study which indicated that adolescents between fifteen and nineteen often prefer science fiction. Reading such popular science-related literature can often interest students in the basic sciences. The journal, Science and Children publishes yearly in its Spring issue an annotated bibliography of outstanding children's books related to science.(4, 10)

Idea Ten: Using Science Materials to Encourage Creative Thinking

Science fiction is an excellent mode to encourage creative thinking. Quina and Greenlaw state that "Science fiction contains a hypothetical picture of what. . . various fields of science may look like under other conditions"(9) and, as such, provides an excellent basis for lessons in creative thinking. Science fiction books are written on all reading levels and, therefore, can be adjusted to the reading needs of students. For example, Quina and Greenlaw suggest that Dune or Stranger in a Strange Land would be appropriate for students reading at a high school level, whereas The City Under Ground or A Wrinkle in Time would be more suitable for students reading at an upper elementary level.(9)

Conclusion

The ten ideas presented above might be used singly or in combination, in their present form or adapted. Even though all the ideas might not be used with every lesson, each one might be used at some point throughout a course of science study.

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